NSF Webinar on NSF Solicitation 14-571

NSF/Intel Partnership on Cyber-Physical Systems Security and Privacy (CPS-Security)

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Outline

- Joint NSF-Intel Partnership
- Cyber-Physical Systems Security Challenges
- Program Details
  - Breakthrough Awards
  - Synergy Awards
  - Ideas Lab
- Frequently Asked Questions
- Program Director Contacts

NSF-Intel Partnership on Cyber-Physical Systems Security and Privacy (CPS-Security)

- Jointly funded partnership between National Science Foundation (NSF) and Intel Corporation
- Supporting fundamental research to make Cyber-Physical Systems more trustworthy and secure, integrating technical, social, and economic perspectives
- Develop a community of researchers focused in this area
- Partnership with Intel provides researchers greater insight and access to industry needs/capabilities/resources; facilitates transition to practice; and provides students opportunities to engage with industry

Cyber-Physical Systems

- Cyber – **computation, communication, and control** that are **discrete, logical, and switched**

- Physical – natural and human-made systems governed by the **laws of physics** and **operating in continuous time**

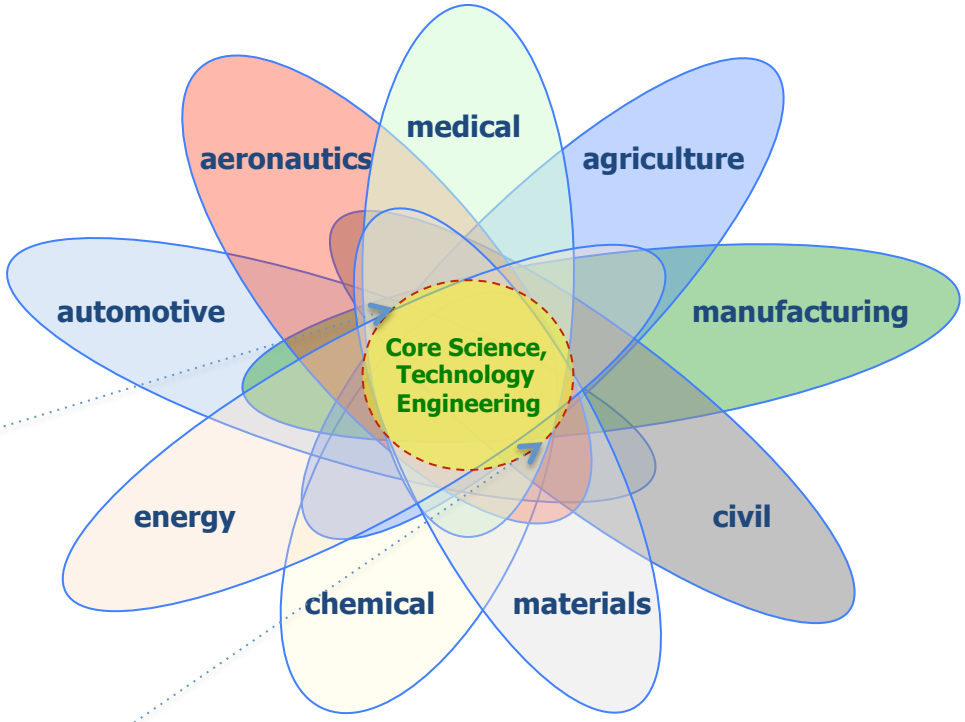
- Cyber-Physical Systems – sociotechnical systems in which the cyber and physical systems are **tightly integrated** at all scales and levels

Cyber-Physical Systems Trends Impacting Security & Trustworthiness

- Reciting the hallmark characteristics:
  - Cyber capability (sensing and/or actuating) in every physical component
  - Networked at multiple and extreme scales
  - Complex at multiple temporal, spatial, social, and industrial scales
  - Constituent elements are coupled logically and physically
  - Dynamically reorganizing/reconfiguring; "open systems"
  - High degrees of automation, control loops closed at many scales
  - Unconventional computational & physical substrates (such as bio, nano, chem, …)
- **Operation must be dependable, certified in some cases**

NSF Model for Expediting Progress

- Abstract from sectors to more general principles
- Apply these to problems in new sectors
- Build a new community



Safety

Verification

Security

Embedded Distributed Networked Hybrid Control

Real-time/Fault tolerant

Interoperable

Scalable

CORE SCIENCE, TECHNOLOGY and ENGINEERING informed by social science, economics, and policy

Challenges

- Sensing and collection of information related to a large spectrum of everyday human activities
- Non-reversible interactions with physical world
- Scale of deployment
- Federated nature of many CPS-based infrastructures
- Deep embedding ("hidden") and long projected lifetimes
- Reliance on subtle assumptions at interface boundaries
  - Hardware and software components, human operators and maintainers
- Human interaction as an arbitrator of CPS security is limited
- Multi-stakeholder environment
  - Manufacturers, operators, users
  - Varying degrees of expertise and control
- Meeting social needs, balancing economic constraints, and formulating policy

How can we enable secure and privacy-preserving Cyber-Physical Systems without sacrificing the benefits of integrating automation with the physical environment?

CPS-Security Program Goals & Objectives

- **Goal:** Foster transformative, multi-disciplinary approaches that address the problem of securing current and emerging cyber-physical systems, the infrastructures they form, and those infrastructures integrated with them

- **Objectives:**
  - Understand the range of technical issues affecting hardware and software in infrastructure components, and their integration in sociotechnical systems
  - Develop an understanding of the interplay between key technical, social, and policy aspects

Sample Topics of Interest

- Security Architectures for CPS
- Tools and Methodologies for Secure CPS Development, Verification and Analysis
- Current and Future Threat Assessment and Countermeasures
- Balance of technical solutions, regulation, and policy incentives to enhance privacy and security
- Effective, Secure, Reliable Control in Centralized and Decentralized Systems

Solicitation Details

- Ideas Lab
- Synergy Proposals
- Breakthrough Proposals

- Eligibility: US Universities and Colleges

Ideas Lab

- Precursor to the submission of full proposals
- Participation not required for full proposal submission
- **Goals:**
  - Identify and develop novel ideas at the intersection of CPS and Cybersecurity
  - Assist in the establishment of research partnerships
- Participation by invitation, following submission of preliminary proposals

Preliminary Proposals

- Necessary for participation in the Ideas Lab
- **Deadline:** July 29
- Submission via Fastlane only (not Grants.gov)
- Individual submissions (no co-PIs)
- Proposal contents
  - 2 pages of Project Description
    - Must follow specific guidelines (see Solicitation for details)
  - Biographical Sketch
  - Current & Pending Support
  - All other elements (e.g., Summary, Budget, …) are waived
- Responses/invitations by August 5

Ideas Lab Mechanics

- Intensive 5-day residential workshop
  - Real-time and iterative review process of research ideas
  - Assisted by a team of professional facilitators and a group of mentors (researchers with relevant expertise)
- 20-30 participants
- **Dates:** August 12-16
- **Location:** Washington DC area
- Travel expenses will be covered by reimbursement through the Computing Research Association (CRA)
- Submission of Preliminary Proposal implies agreement to attend the full Ideas Lab if invited

Ideas Lab Proposals

- Mentors will provide recommendations to NSF about ideas developed in the Lab
- Within 7-14 days, NSF will determine which participant teams will be invited to submit full proposals
- Invitation does not imply funding guarantee!
- Non-invited ideas can still be submitted as full proposals
- Repeat: participation or invitation not required for full proposal submission

Full Proposal Submission Details

Proposal Type	BREAKTHROUGH	SYNERGY
Conditions	< $500,000 & up to 3 years	< $3,000,000 & up to 3 years
Proposal Limits	Two (2) Proposals per PI Distinct from the PI limits of SaTC or CPS solicitations	
Title Format	Begins with "**Breakthrough:**"	Begins with "**Synergy:**"
Deadline	Thu 28 October 2014 5:00PM Proposers' Local Time	

Must upload *statement of consent* (as Supplemental Documentation) that indicates *NSF may share with Intel* the proposal, the reviews generated for the proposal, and any related information

No classified proposals will be accepted

Full Proposal Review Process

- Administered by NSF, in accordance with NSF standards and procedures
- NSF and Intel program directors coordinate on review panels and award recommendations for Synergy proposals

Projects selected for joint funding by NSF and Intel will be funded through *separate* NSF and Intel funding instruments

CPS-Security Synergy Proposals

- Jointly funded by NSF and Intel
- Expected number of awards: 2
- Take a holistic view of the challenges in protecting CPS
  - Account for technical, human, policy, and economics factors
- Separate 2-page collaboration plan is required
- Additional Solicitation Specific Review Criteria
  1. Degree of integration of the technical research with the broader security context in CPS
  2. Pursue the development of a Systems perspective and drive toward demonstrations of interrelated component research ideas

CPS-Security Breakthrough Proposals

- Funded by NSF
- Encourage the collaboration of at least two PIs
  - Bring together the CPS and SaTC communities
- Separate 2-page collaboration plan is required
- Expected number of awards: 4

Award Details

- NSF and Intel will manage their respective award according to their own procedures and guidelines
- All Synergy awards involving Intel funds will be made under a contract that requires:
  1. All source code that has been authored while working on such an award will be distributed under a BSD, Apache or other equivalent open-source license. GNU's GPL or LGPL, the Artistic License, or the Mozilla Public License are not considered equivalent. See solicitation for details.

Award Details

- All Synergy awards involving Intel funds will be made under a contract that requires:
  2. No incorporation of any third-party code or background intellectual property, except by separate pre-arrangement with NSF and Intel, into data or software generated while performing the work under the award, if said incorporation would limit or restrict the ability to distribute the data or code under an open source license.
  3. Awardees may file patent applications, providing that they grant to Intel a non-exclusive, worldwide, royalty-free, sub-licensable license to all intellectual property rights in any inventions or works of authorship resulting from research conducted under the joint award.
- Note that conditions 1, 2 and 3 do not apply to Breakthrough awards

Intel Participation in Research

- Intel may separately fund its own personnel to directly participate in awardee institutions
  - Under mutual consent by Intel and awardee institution
  - Goal: identify opportunities for technology transfer, act as advisors or collaborating researchers
- Intel may also designate (by mutual agreement) a senior researcher as a member of the Project Management Team

Post Award Management

- For all: Awardees must submit annual reports to the appropriate funder(s)
- For all: One or more project representatives must attend the next NSF/SaTC PI meeting (following project award)
- Synergy-only: Intel will conduct annual retreats
- Synergy-only: Annual on-site reviews may be conducted jointly by NSF and Intel
- Synergy-only: Intel may lead the organization of phone calls with project teams; NSF may participate

Takeaways

- CPS-Security is an exciting new opportunity for NSF funded researchers to work closely with industry and to explore an increasingly important area domain. CPS-Security researchers will help provide assurance that sociotechnical Cyber-Physical Systems will be secure and trustworthy into the future.
- Proposals due 28 October 2014 to NSF
- Contact an NSF and/or Intel program officer with questions!

For further questions

If you have additional questions after the webinar concludes, please send them via email to

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with the subject line starting with "CPS-Security:"

The presentation will be available following the WEBINAR at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505047

The solicitation is available at

http://www.nsf.gov/pubs/2014/nsf14571/nsf14571.htm

Q u e s t i o n s ?

The telephone line is now open

Frequently Asked Questions

Frequently Asked Questions

Proposal Submission Related

Q: Can I submit the same proposal to SaTC or CPS, and CPS-Security?

A: No, you must choose one program.

Q: Does a submission to CPS-Security count towards the 2 proposal limit for SaTC?

A: No, you can submit 2 proposals to SaTC and 1 to CPS-Security.

Q: Can a CPS-Security proposal include a Transition to Practice Option?

A: No, those are for SaTC only.

Frequently Asked Questions
Scope Related

Q: How do I decide whether to submit to SaTC or CPS-Security?

A: If you are interested in the benefits that go along with Intel funding then please submit to CPS-Security. Talk to a SaTC or Intel program director if you are unsure.

Q: Does the new CPS-Security program mean that SaTC will be reducing funding for CPS security?

A: No. CPS security is still a priority for SATC.

Frequently Asked Questions
Award Related

Q: How many awards will be made?

A: We expect to make 6 CPS-Security awards (4 Breakthrough and 2 Synergy), subject to the availability of funds.

Q: Is there a difference contractually between an NSF award and an Intel award?

A: The NSF funding agreement is a "grant"; the Intel funding agreement is a "contract". Deliverables vary.

Frequently Asked Questions

Award Related

Q: If co-funded, is the same proposal used for both NSF and Intel?

A: Yes. There is a single technical description or Statement of Work for each project, but two funding agreements. Awardees will be provided guidance on how to split the budget.

Q: Will Intel fund participants at non-US institutions (which are not funded by NSF)?

A: No. All funded participants must follow standard NSF eligibility requirements.

Frequently Asked Questions

Financial Related

Q: Is this new money (in addition to SaTC)?

A: NSF is funding CPS-Security out of SaTC funds. We are pleased to combine NSF funds with Intel funds.

Q: Is CPS-Security a multi-year program?

A: Yes. NSF anticipates continuing investment in this area for multiple years, subject to the availability of funds.

Frequently Asked Questions

Intellectual Property Related

Q: Are there any restrictions on intellectual property as a result of Intel involvement?

A: For Synergy awards: Under the standard Intel contract, the University retains ownership and Intel receives a non-exclusive royalty free license to any IP developed.

For Breakthrough awards: These are standard NSF awards with no participation by Intel. The University retains full ownership.

Q: Can we get access to Intel technology?

A: Potentially. This would be handled on a case by case basis between Intel and the awardee university.

Frequently Asked Questions

Additional PI Requirements

Q: Do I have to attend the NSF biennial SaTC PI Meetings and Intel reviews?

A: For Synergy awards: yes

For Breakthrough awards: only the NSF biennial SaTC PI Meetings

Q: Do I have to submit reports to both Intel and NSF on a CPS-Security award?

A: Yes, for Synergy awards. The contents of the two are similar.

Frequently Asked Questions

Post Award Related

Q: Will Intel be actively involved as collaborators and working on spin-off projects, or provide in-kind support?

A: Intel may fund its own personnel to directly participate in research done through Synergy awards, via its Researchers in Residence program. This will require mutual consent between Intel and the awardee. Intel may designate (and self-fund) one of its senior researchers to work alongside the Synergy PI(s), as member of the project management team, providing perspective on commercial aspects, help with day-to-day leadership of the center, and coordinate engagement of all other Intel researchers.